



Natural Gas Supply and the Transportation Market



Overview

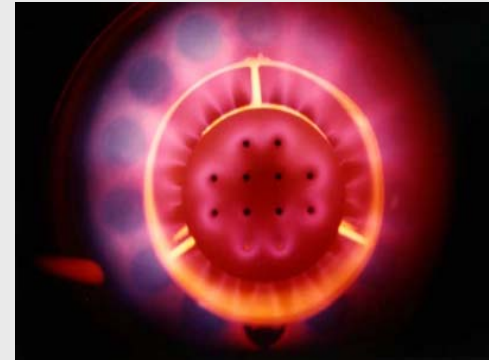
- > Introduction
- > Natural Gas Supply Outlook
 - Factors influencing North America
 - > Near term factors
 - > Long term factors
- > Role of Vehicles & AFVs In Energy Use
- > Summary

GAS TECHNOLOGY INSTITUTE

- > Independent Not-for-Profit R&D Organization
 - 18-acre campus
 - 350,000 ft² facility
 - Labs, test facilities, library, classrooms, offices
- > Energy & Environmental Topics
- > Natural Gas and Hydrogen Focus



Gas Supply and Pipelines



Combustion



Transportation



Fuel Cells

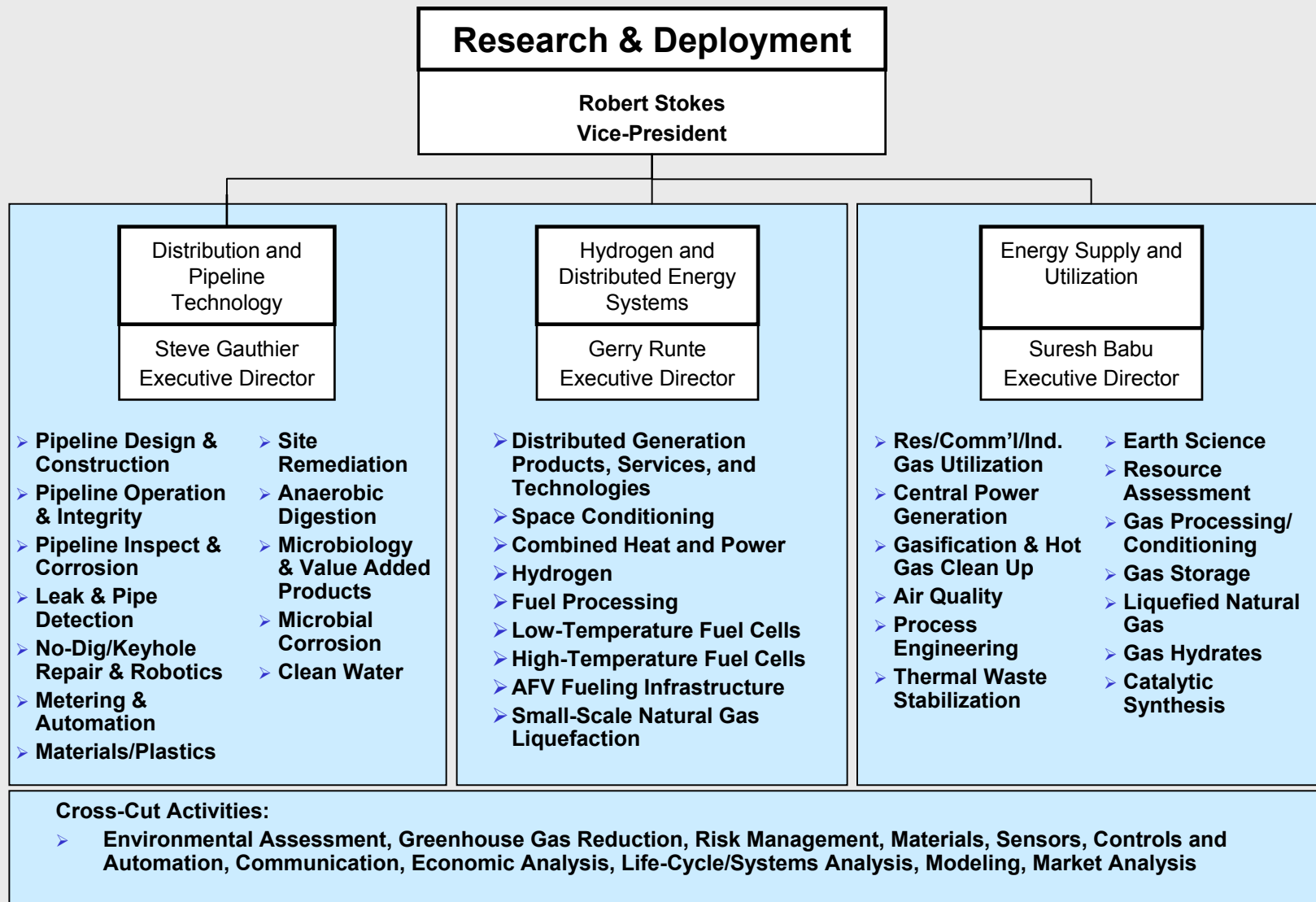


Distributed Generation



Biotechnology

GTI R&D Organization



Economics 101

Gas Supply, Demand, and Prices

- > Natural gas price factors
 - Supply
 - > Including storage and delivery
 - Demand
 - > Basic demand drivers
 - Economy, growth, weather
 - > Elasticity considerations
 - Consumer sensitivity to price
 - Consumer choice (intrafuel)
 - Consumer choice (interfuel—that is, switchability)

Natural Gas Industry

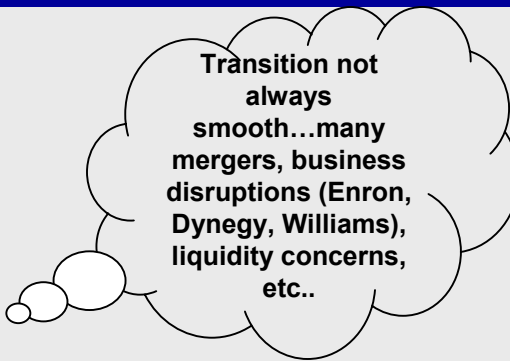
Yesterday & Today

Yesterday

- > Industry regulated, monopolistic, and/or fraternalistic
 - Natural gas wellhead price controls
 - Pipeline companies bought gas from gas producers
 - > Long-term contracts were normal
 - Local distribution companies (LDCs) bought gas from pipeline co's
 - > Sold fully bundled services to customers

Today

- > Industry increasingly deregulated
 - No wellhead price controls
 - Greater internal industry competition
 - Services increasingly unbundled
 - Pipelines & LDCs mainly deliver commodity
 - Market specialists
 - Limited use of long-term contracts
 - > Emergence of Futures market



Transition not always smooth...many mergers, business disruptions (Enron, Dynegy, Williams), liquidity concerns, etc..

Today's “Integrated” Natural Gas Industry



Growing level of stability—getting back to basics. Essential since these firms must make major investment decisions.

- > Gas industry comprised of many individual companies making individual decisions
 - Natural Gas Producers
 - > A few majors and many small independents
 - > Unregulated
 - Interstate Pipeline Companies
 - > Fall under FERC jurisdiction
 - Gas Storage and Import Terminal Operators
 - > Fall under FERC jurisdiction
 - Local Gas Distribution Companies
 - > Mostly publicly traded companies or municipals
 - > Fall under state utility commission jurisdiction
 - Natural Gas/Energy Marketers

U.S. Natural Gas Supply and Delivery Infrastructure



Natural Gas Production

- Operating wells, drilling rigs
- Gas processing plants

Natural Gas Storage and Peakshaving

- Underground storage
- Peakshaving Plants
 - LNG and propane/air
- LNG Import Terminals

Natural Gas Delivery

Pipeline Network

- 290,000 miles (transmission)
- 1,100,000 miles (distribution)
- Plus pipeline interconnects with Canada, Mexico



Natural Gas Prices

- > What do we know about direction of gas prices?
- > Short term
 - Variety of factors will influence prices during winter
 - > Mainly weather, storage, and responsiveness of existing wells
 - Recent years more volatile due to close supply-demand balance, many buyers operating on spot market
- > Long term
 - The U.S. has a collection of maturing wells
 - More investment needed...often in more difficult and challenging environments
 - > Technically and politically
 - Imports, including LNG, become more prominent
 - Better use of financial (i.e., futures) market?

Short-Term Gas Price Factors

> Supply

- Driven by number of operating wells, production rates, number of rigs, storage, deliverability, prices

> Demand

- Driven by weather, underlying economy, prices

> Elasticity

- Prices, degree of fuel switching

“The key drivers that will determine natural gas prices this heating season are oil prices, weather, the weather adjusted supply-demand balance and the working gas storage level at the end of the non-heating season.”

Ron Denhardt

Vice President, Natural Gas Services

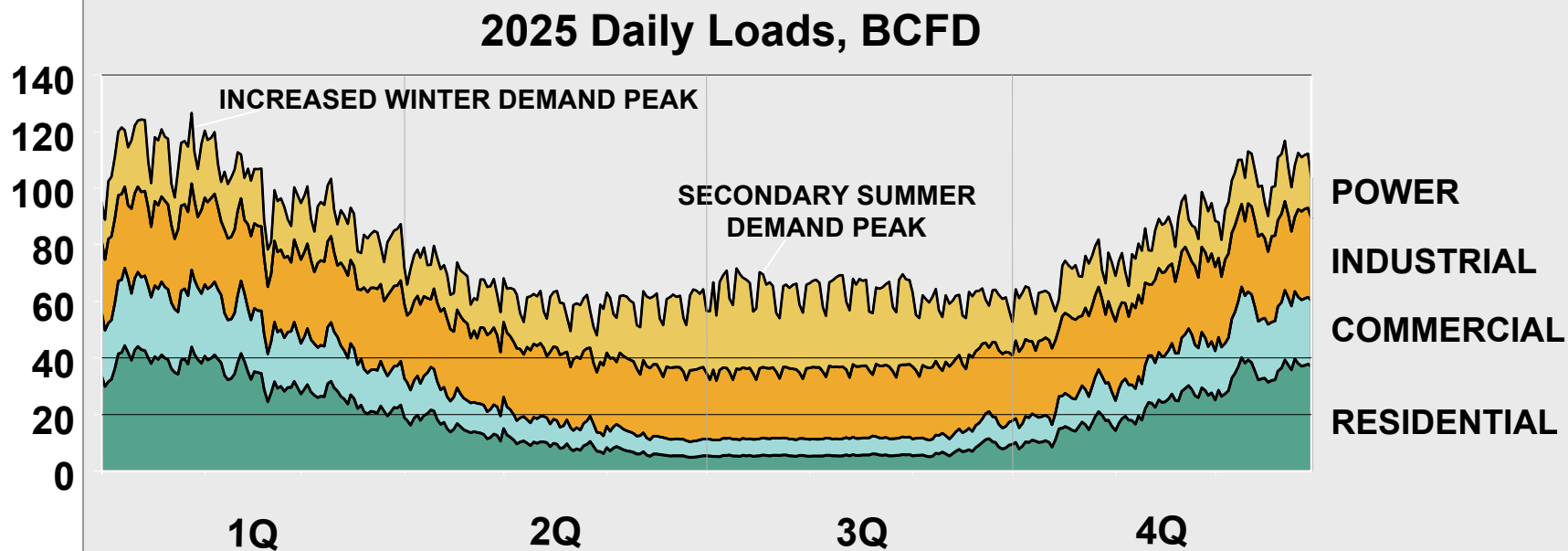
October, 2003

Short-Term Gas Price Factors

Its Not Just Winter Temps Anymore

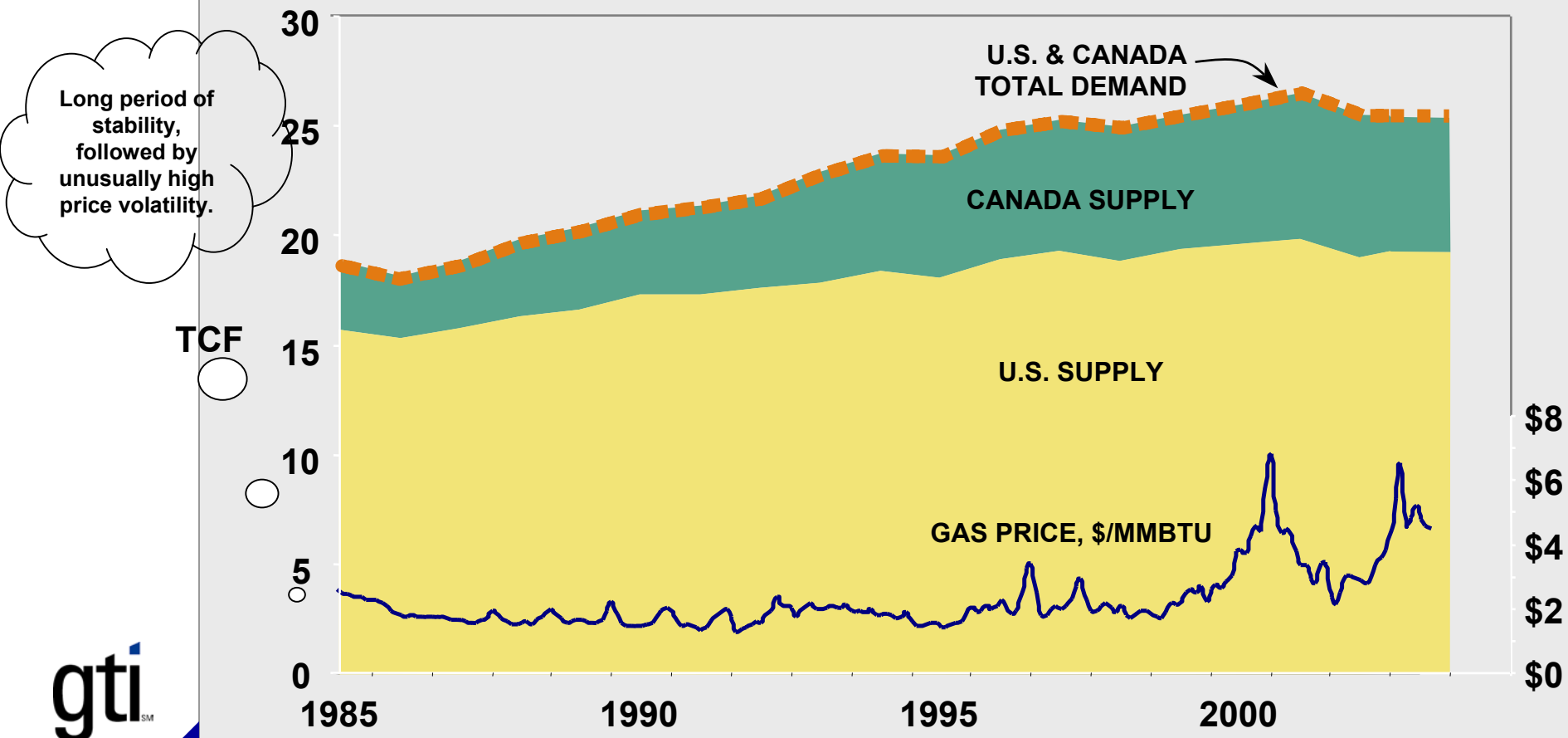
- > Historically, natural gas experiences high winter demand
- > While winter remains main peak, summer is growing in importance
- > Very hot summer temperatures can drive gas natural gas demand (and prices) for gas turbine power generation
 - This is historically the period when gas is placed in storage
 - Higher off-peak summer prices may inhibit operators from putting gas in storage or at least increases the cost of gas storage

Peak Demands Are Becoming More Pronounced



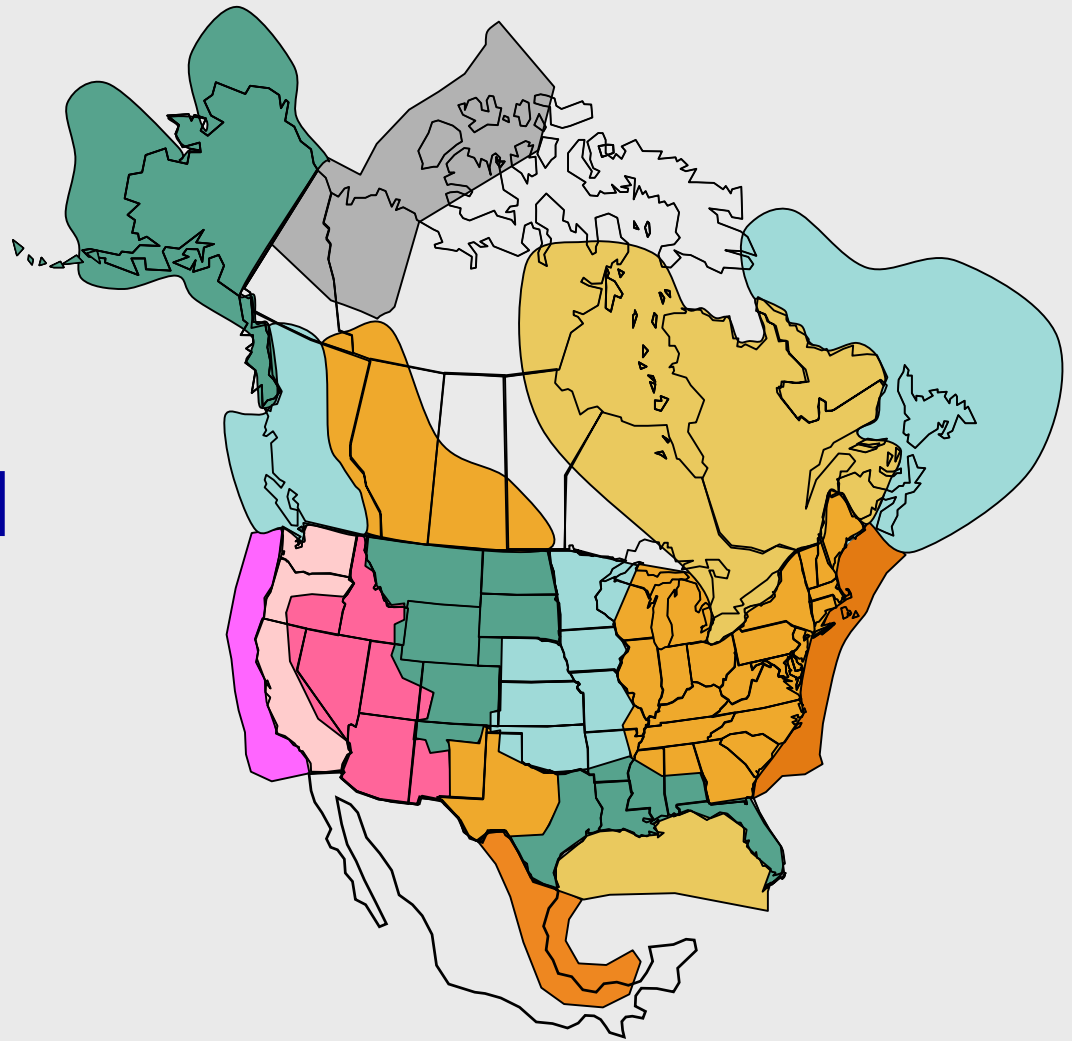
Increased Price Volatility

Reflect Changes in Supply, Demand, Purchasing Habits, and Regulations

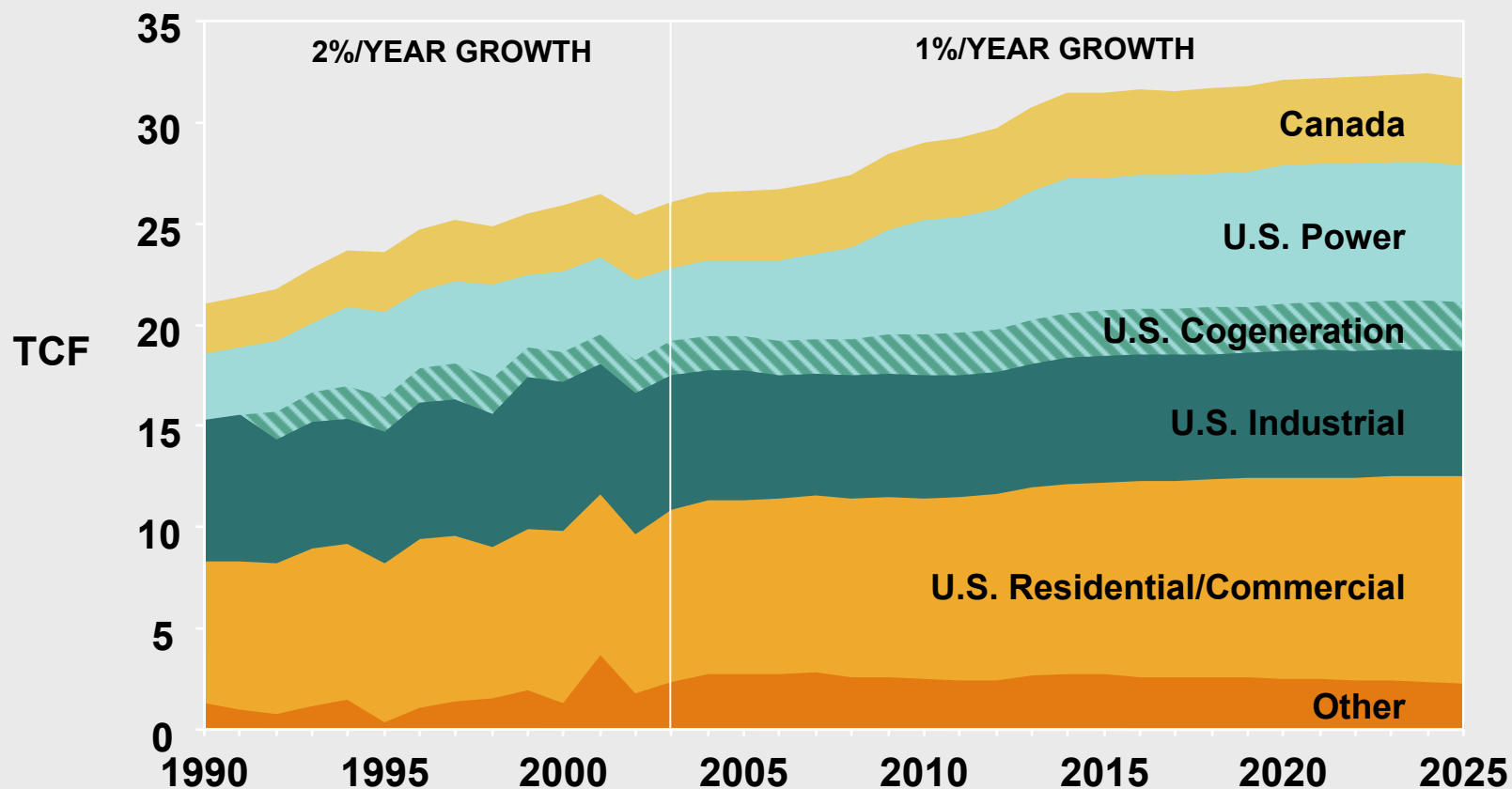


Source: National Petroleum Council (2003)

North American Resource Base: Large and Diverse

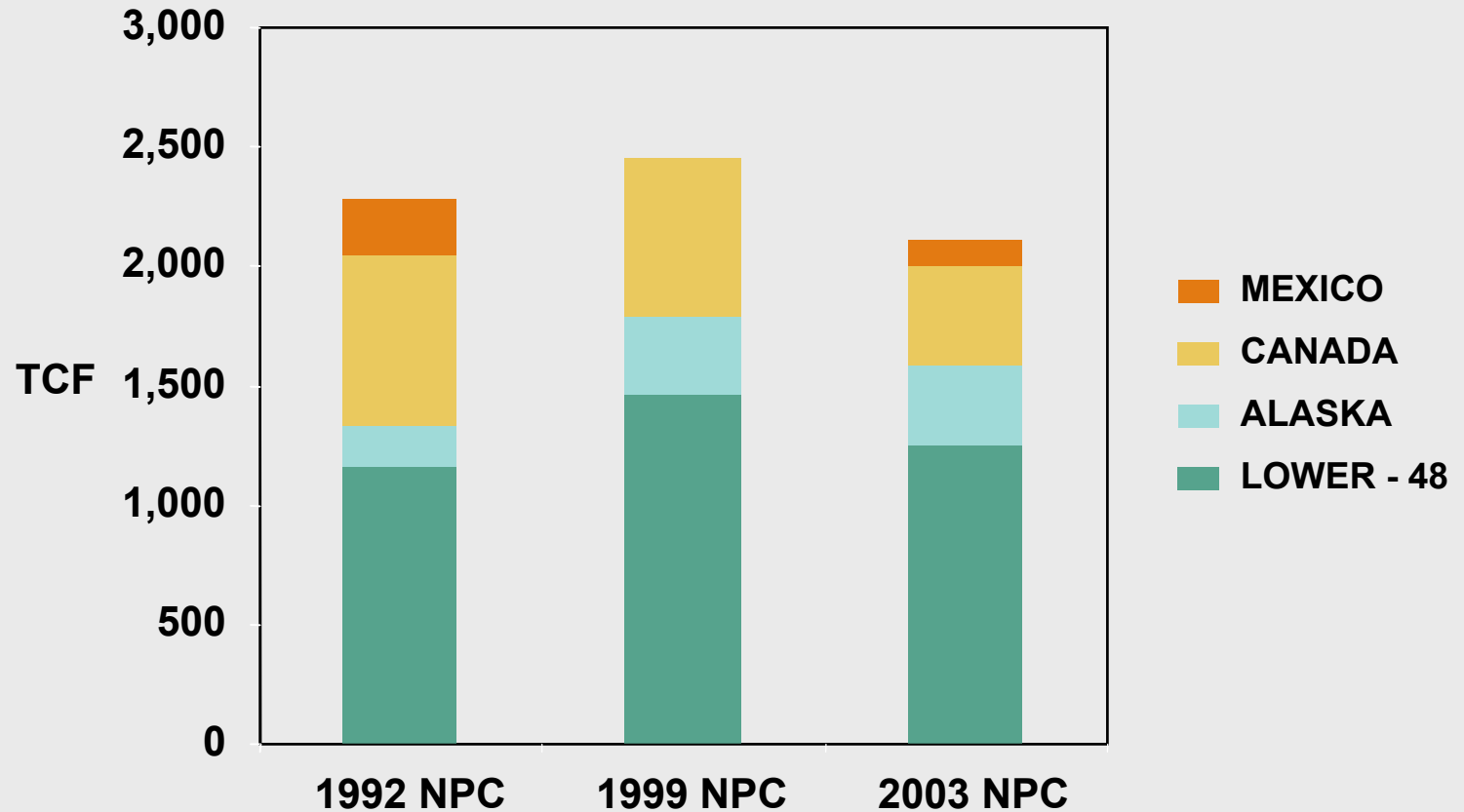


Demand is Diverse and Power Generation Will Drive Growth



North American Resource Base

Technical Resource



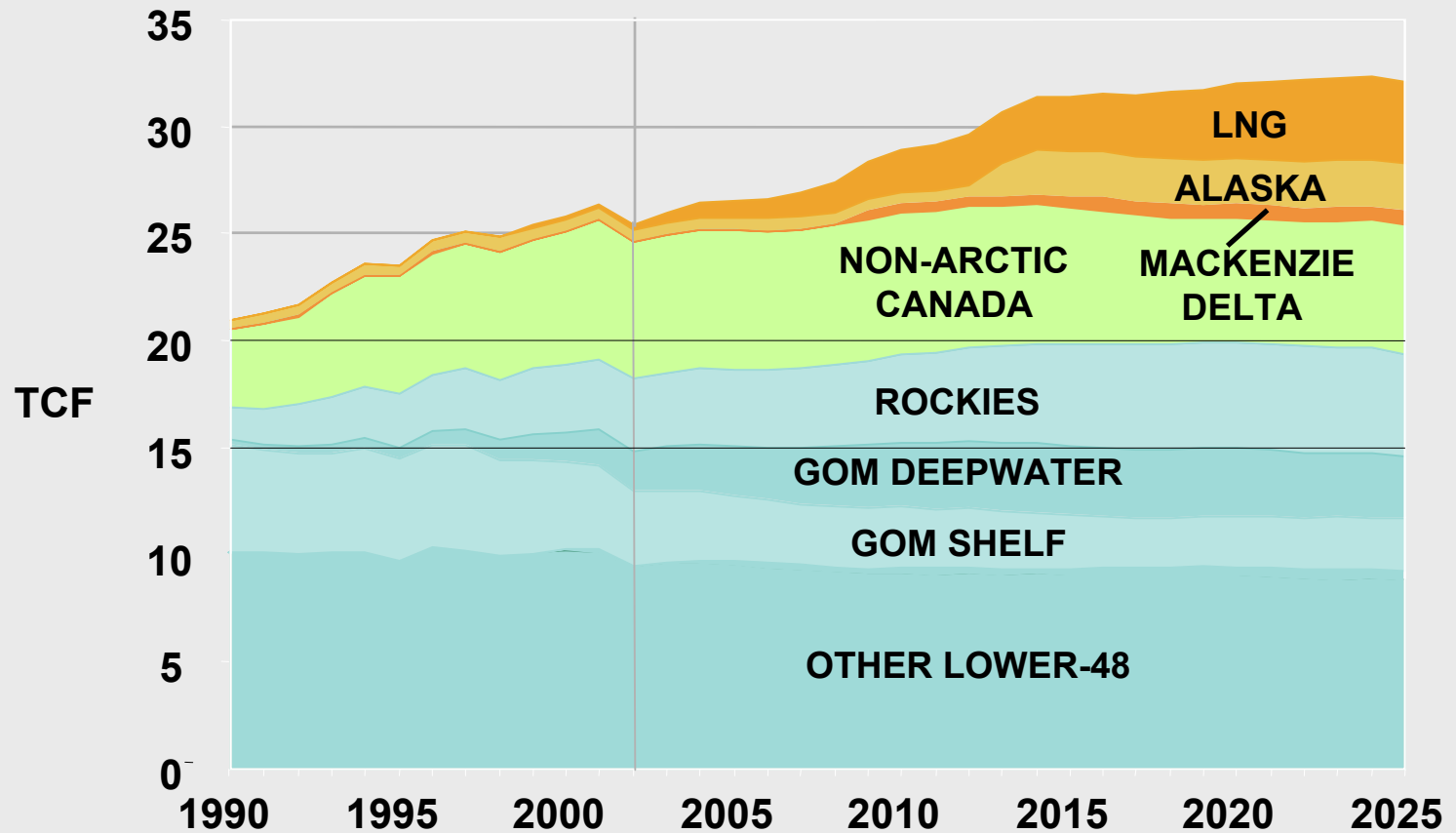
Multiples of current
demand (years)

85

93

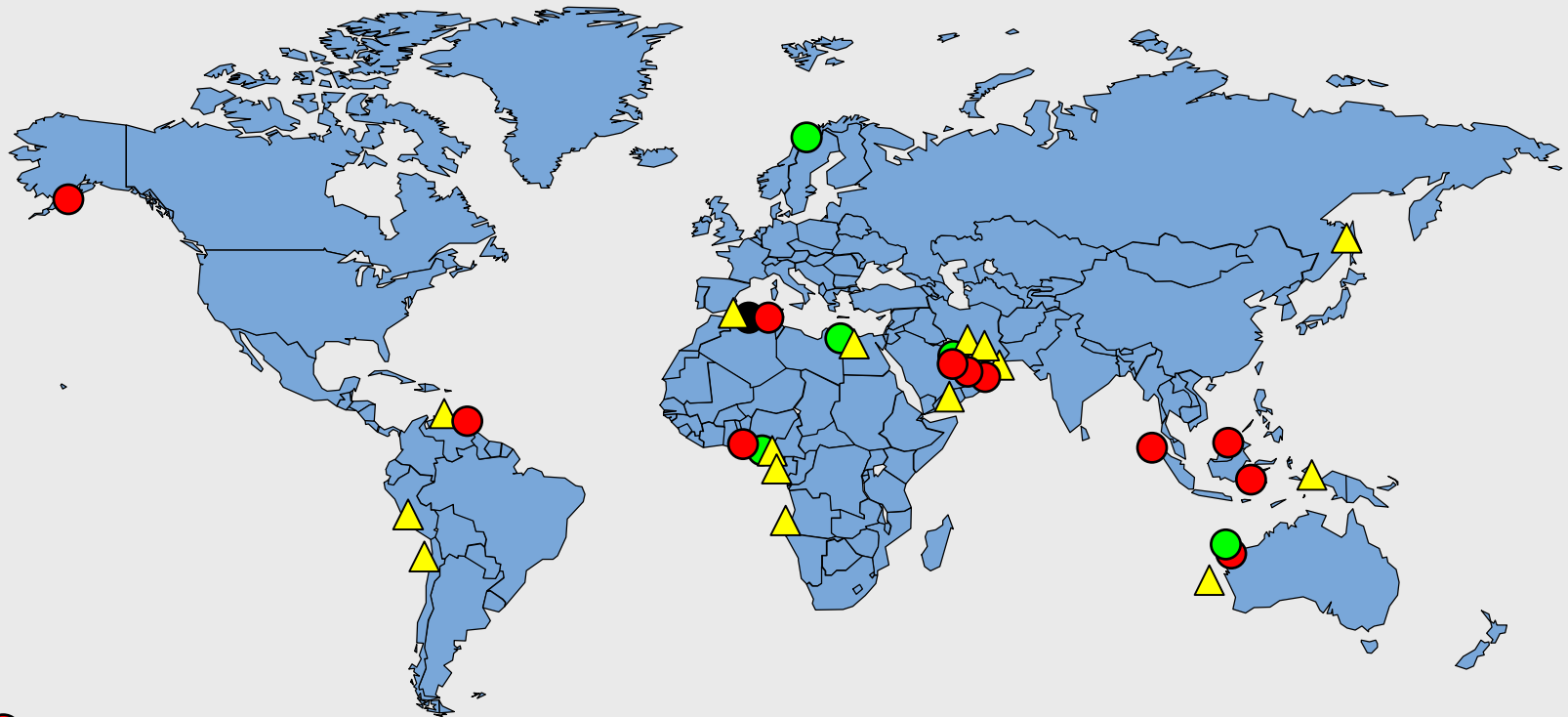
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Future Supplies From Traditional & New Sources



Worldwide Natural Gas Resources Are Vast

Global LNG Supply Facilities

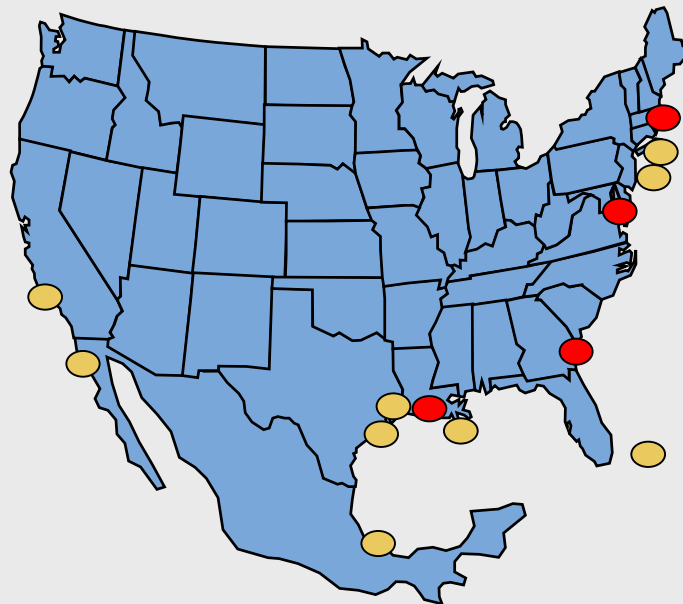


- Existing
- Under Construction
- ▲ Proposed

**Annual Global Consumption
< 2% of World Proved Reserves**

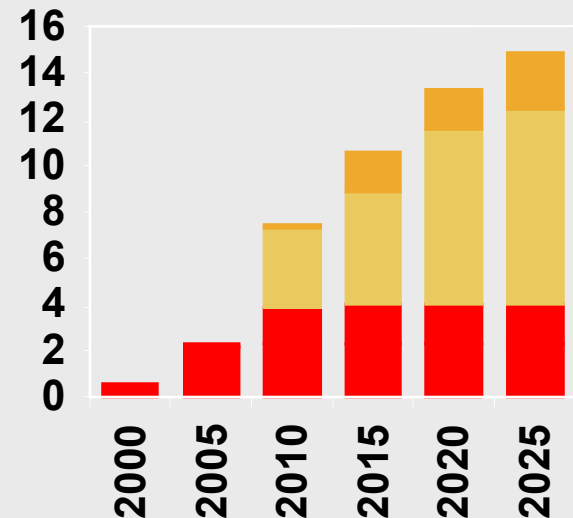
LNG Imports Are Needed, But Face Obstacles

Import Terminals



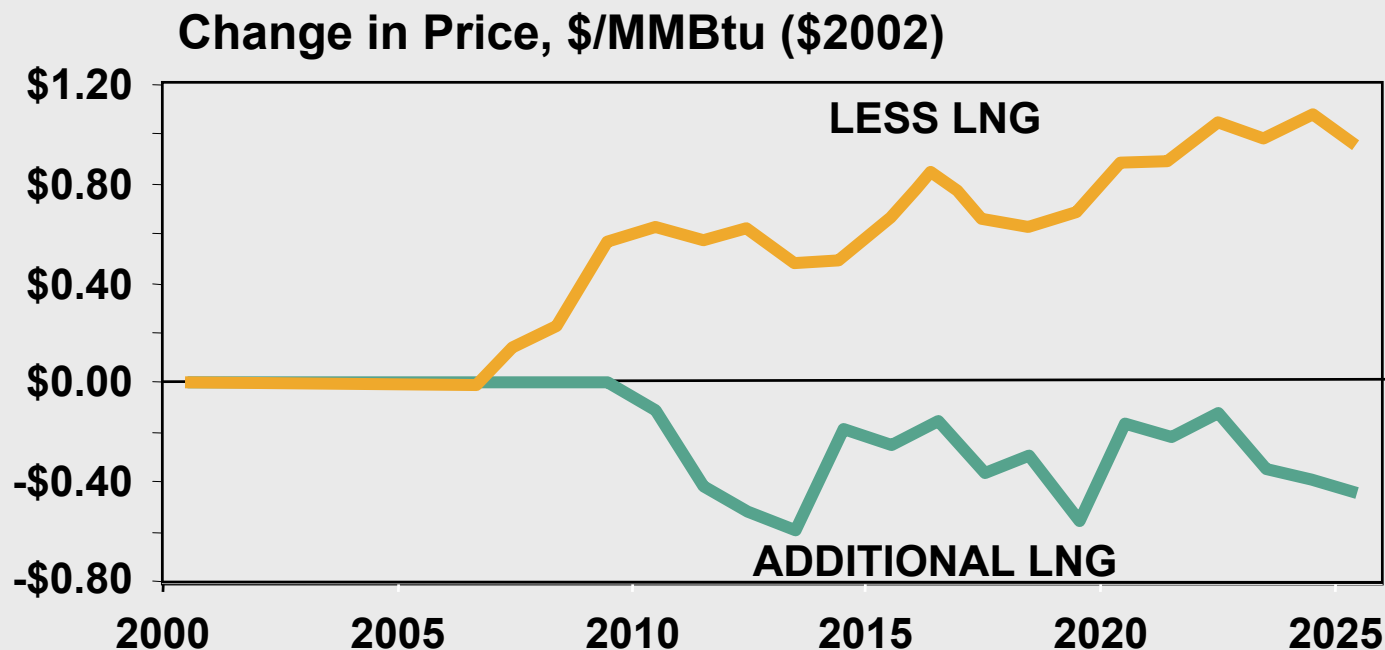
● Existing
● Potential

Projected Imports
BCFD



■ New - Balanced Future
■ New - Reactive Path
■ Existing & Expansions

LNG Imports Can Lower Costs to Consumers

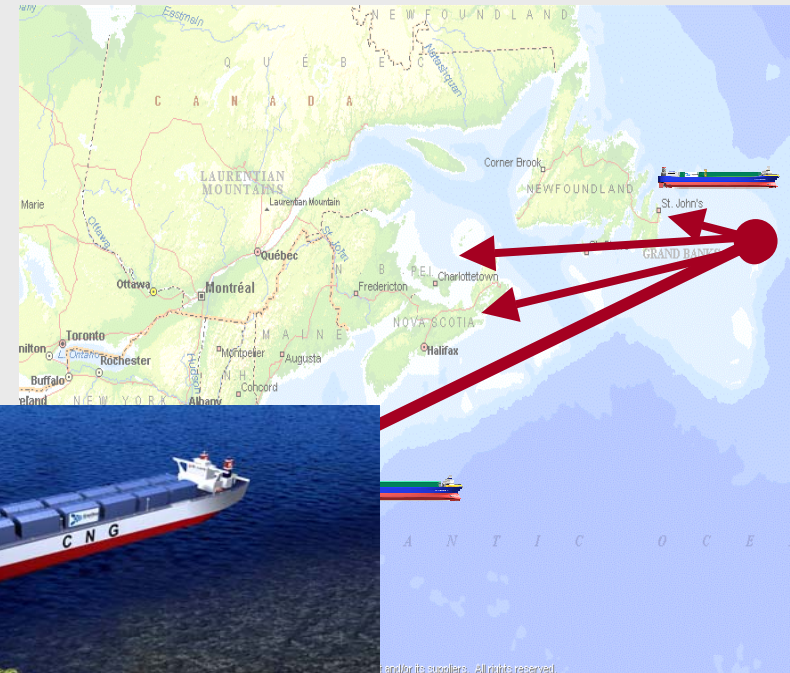


More LNG use can address peaks, supplement conventional gas storage & reduce price volatility

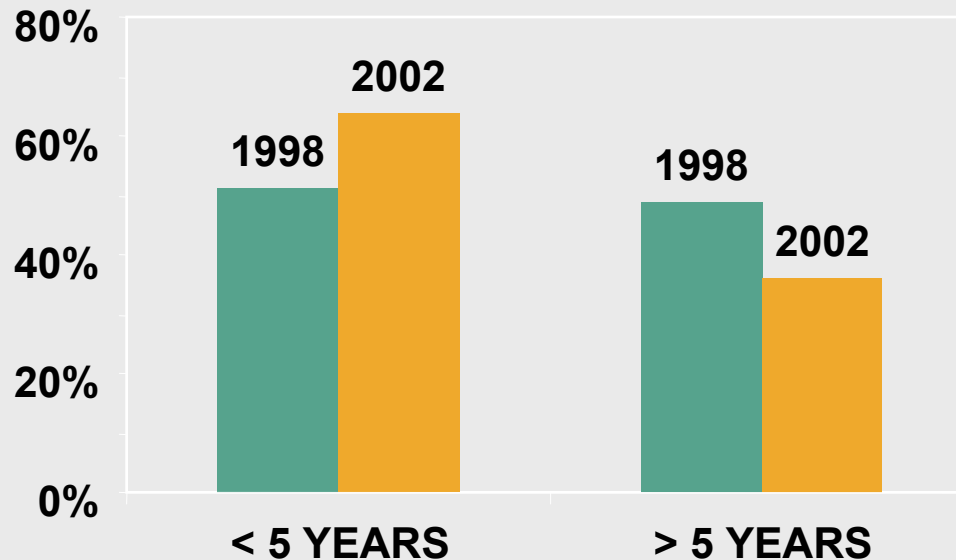
CNG Transport

Complement To LNG Transport

- > Large-scale ocean transport of compressed natural gas
 - EnerSea, others
- > Use for regional transportation
 - Caribbean/South America to U.S.
 - Canadian Atlantic Coast to U.S.



Firm Contract Expirations

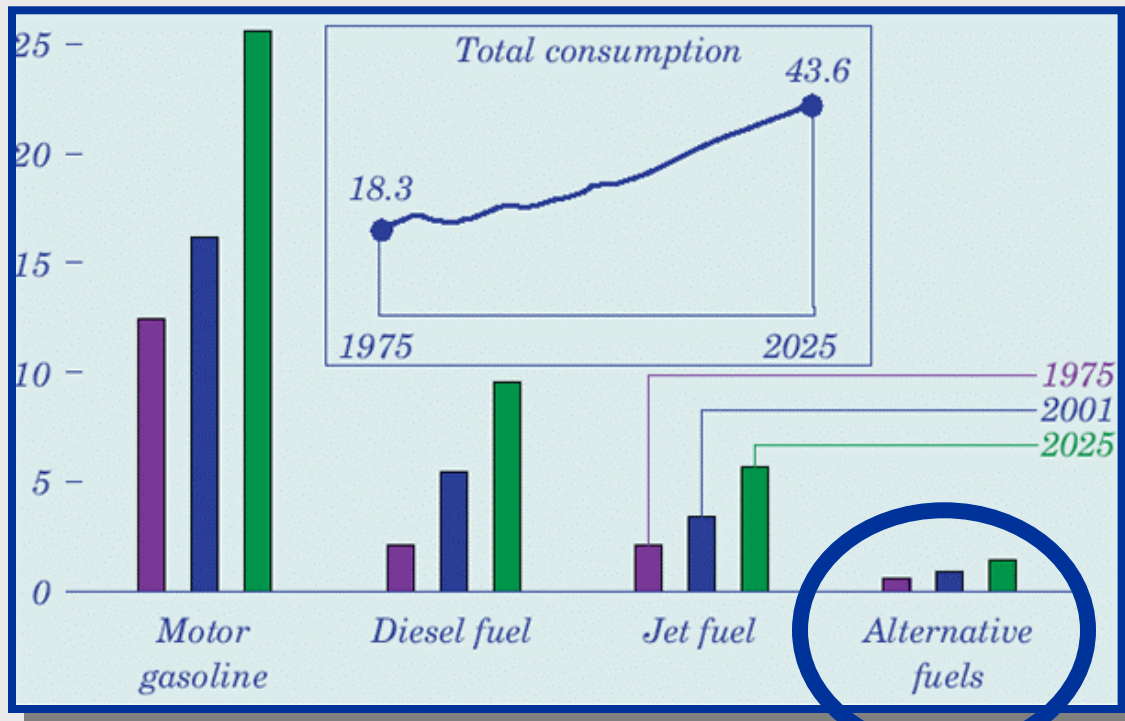


Financial markets are continuing to grow, but fewer long-term contracts than historical

Nymex Open Interest - Natural Gas Contracts



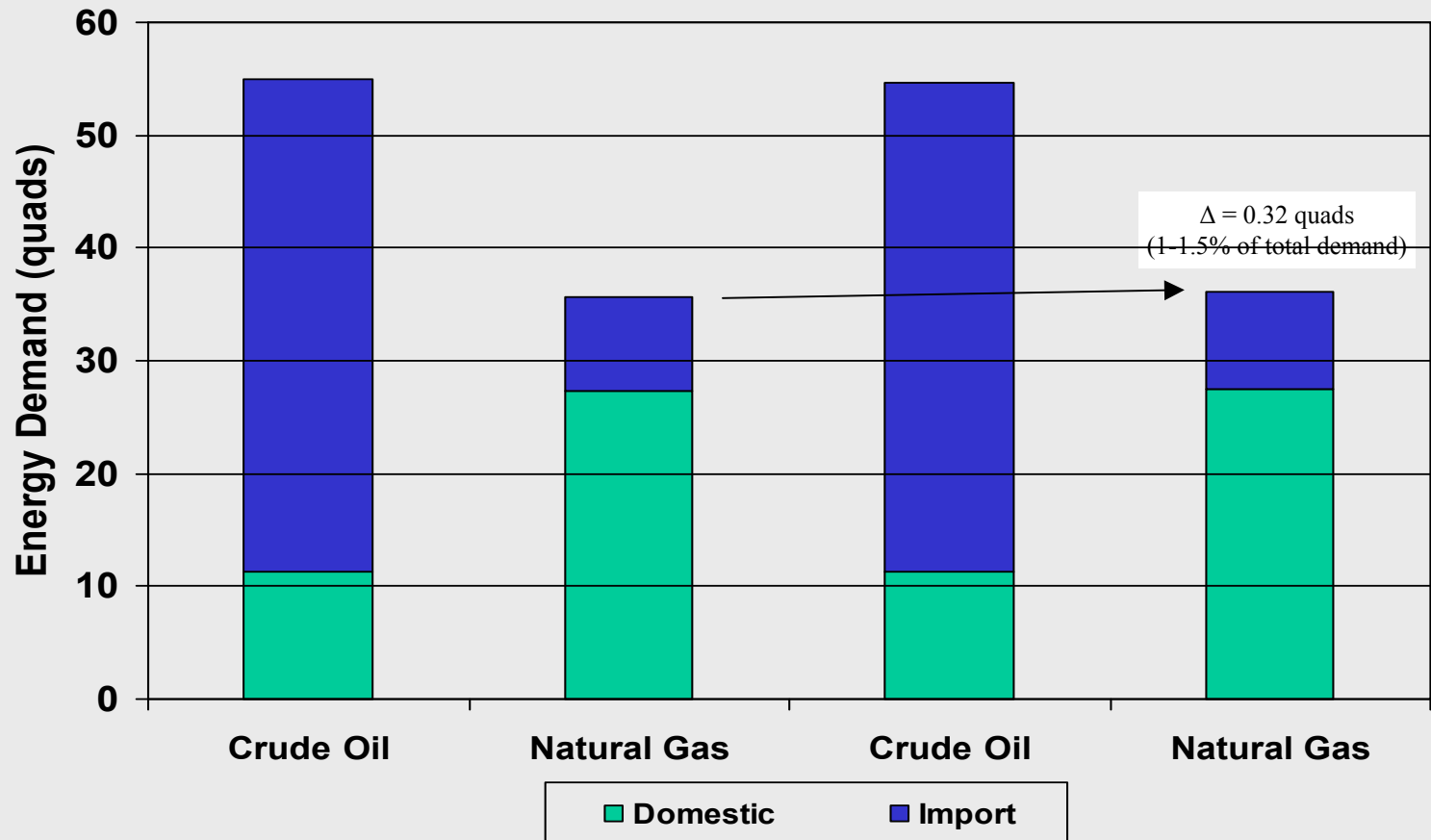
DOE Projection AFV Use in 2025



DOE/EIA Annual Energy Outlook – 2003
Transportation Sector

In 2025
2.8 billion
gasoline gallons
345 bcf of
natural gas

Projected Natural Gas Demand From Alternative Fuel Vehicles in 2025



Summary

- > Adequate supplies of natural gas in North America
- > Price factors in short term driven by weather and other considerations
- > Continued investment in domestic resources supplemented by relatively modest imports
- > Maturing “deregulated” gas industry, growing futures market, and longer-term contracts should reduce price volatility
 - Capital intensive, long-term investments can’t be financed with spot market pricing

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